

# **Results of Methamphetamine-Contaminated Clothing Decontamination in an Experimental Trial**

**By**

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## **Introduction:**

Research conducted by National Jewish Health has indicated that the contamination associated with the clandestine manufacture of methamphetamine laboratories does not end when the laboratory ceases operation.<sup>(1,2)</sup> Simulated methamphetamine cooks conducted by our group have demonstrated that a number of compounds may persist after the cook has been completed. Initial testing revealed that shortly after a clandestine cook, levels of iodine, hydrogen chloride, and methamphetamine were found at the site even though the bulk chemicals may have been removed. The largest contaminant was found to be the drug, methamphetamine, itself. Methamphetamine was found to aerosolize during the salting-out phase conducted during all current production methodologies. It is released as an aerosol and can contaminate most surfaces within a structure.<sup>(1)</sup> Our research also indicated that the methamphetamine continues to be present within the structure for some period of time (months to years).

Additional research conducted by the National Jewish Health has determined that, not only is a clandestine methamphetamine laboratory contaminated with methamphetamine but it is possible for individuals entering the structure to also become contaminated.<sup>(2)</sup> We found that any activity enabled methamphetamine accumulated on surfaces to be re-suspended into the air and to contaminate the clothing of individuals present in the structure.

Concern regarding contaminated clothing and cloth materials in association with clandestine methamphetamine laboratories has been a concern for law enforcement, social services, school, and public health individuals for some time. In the case of a clandestine laboratory investigation, the clothing worn by individuals is usually discarded or kept by law enforcement but in the case of children being picked up at school or individuals entering detox centers, the situation becomes less clear. In addition, although clothing worn by individuals may be discarded, few law enforcement agencies discard clothing from the contaminated structure.

The case of what must be done with methamphetamine-contaminated clothing in instances where a clandestine methamphetamine laboratory was not identified is also unclear. Should clothing from structures where methamphetamine was only being used be discarded? Should clothing worn by social services personnel entering a possible methamphetamine manufacturing or use situation be discarded? What should be done with the clothing of an individuals entering a care facility? Should all of the clothes be discarded or can they be decontaminated? If they can be decontaminated, how should that be accomplished?

The answers to these questions and more have usually been answered by suggesting that the clothing be washed and that the washing process will remove the methamphetamine contamination. Some agencies have suggested that the clothing be washed at least 3 times before re-issuing the clothes. The reasoning behind these requirements appear to be primarily based on the assumption that methamphetamine is water soluble and that it will be quickly removed from clothing under most conditions. This is partially borne out

by experiments that we have conducted suggesting that washing off the suits worn by emergency responders does reduce the external methamphetamine contamination. However, these suits are normally very smooth and easily cleanable while most clothing is not.

This project was designed to determine how easily normal clothing can be decontaminated by simply washing the clothing. We also tested fire department bunker gear (fire protective clothing) that was donated by the Calgary, Canada Fire Department. The results of this study will be utilized to modify current protocols regarding the decontamination of clothing from individuals exposed to structures where methamphetamine is manufactured or used.

### **Methodology:**

In order to determine the decontamination effectiveness of washing, two types of cloth were initially purchased. The first type was a denim cloth similar to what is commonly worn by individuals (both adults and children) and the second was a more porous cloth similar to a child's blanket. These materials were chosen since they are relatively porous, commonly utilized, and are good examples of the clothing and materials commonly found in methamphetamine laboratories. The denim cloth is a relatively tight weave that might be expected to maintain the methamphetamine better than the blanket cloth which was a lighter, more porous weave.

The cloth was initially bought in a length that was approximately 72" long and 63" wide. It was then cut into 6 panels that were approximately 24" x 30" and hung in a stainless steel exposure chamber using duct tape.



Figure 1. Interior of chamber showing the cloth material hanging on the sides of the chamber prior to aerosolization of the methamphetamine.

The fire department bunker gear was simply installed in the chamber in an upright position using wood boards to hold up the jackets. The jackets were buttoned up but did not have the bottom of the suit or the neck closed.

After the clothing and bunker gear was installed into the chamber, it was charged with approximately 212 mg of methamphetamine using a glass beaker and a beaker heater. The methamphetamine utilized was a street-manufactured methamphetamine provided by the North Metro Task Force in Colorado. The drug was approximately 77% methamphetamine and also contained small amounts of amphetamine, ephedrine, and pseudophedrine. No MDMA or phenylpropanolamine were found to be present. The methamphetamine was put into the beaker and the chamber was sealed and the methamphetamine aerosolized into the chamber. The methamphetamine was completely aerosolized within 24 minutes and the beaker heater was turned off. The fans within the chamber were kept running for another 1.4 hours to assure even distribution of the methamphetamine. The chamber was then allowed to sit overnight and the material was removed the next day.

After opening, the clothing material was removed and put into a plastic ziplock bag for transport. The panels were divided into 5 groups for testing. The groups were as follows:

- a. One panel was not washed.
- b. One panel was washed 1 time and then tested.
- c. One panel was washed 2 times and then tested.
- d. One panel was washed 3 times and then tested.
- e. Two panels were kept in a zip-lock bag for use at another date if necessary.

Samples were collected prior to treatment and after treatment, resulting in a total of 14 samples being taken from each panel. Each sample consisted of a 100 cm<sup>2</sup> piece being cut from the panel and put into a plastic centrifuge tube for analysis. The samples taken were as follows:

- f. 7 samples were taken from the panel prior to the treatment.
- g. 7 samples were taken from the panel after the treatment.

For each panel, there were a total of 42 potential 100 cm<sup>2</sup> samples available. The squares sampled were determined using random number generator for each panel using numbers from 1 – 42. The two groups of 7 samples were generated with no replicates and the position of the samples were located on the clothing panel using the following template:

i.	1	2	3	4	5	6
ii.	7	8	9	10	11	12
iii.	13	14	15	16	17	18
iv.	19	20	21	22	23	24
v.	25	26	27	28	29	30
vi.	31	32	33	34	35	36
vii.	37	38	39	40	41	42

The samples were obtained by cutting the 100 cm<sup>2</sup> square out of the cloth using a pair of scissors and inserted the cloth into a plastic centrifuge tube for analysis. All of the samples were shipped via overnight mail for analysis.



Figure 2. Samples being taken from the denim cloth during the experiment.

After the pre-sampling, the cloth was washed in a household washer using medium temperature water and Cold Water Tide as the detergent. No bleach was utilized and the cloth was washed using a medium agitation setting. After one wash, the panels that were to test the effectiveness of one wash were removed and the other panels washed again. This was continued until all three panels had been washed (1 wash, 2 washes, and 3 washes). The denim and cotton materials were washed at the same time.

After the material was washed, it was hung to dry overnight and then the post samples were obtained. The panels were sampled in the order of the lowest expected contamination. That is, the panel with 3 washes was sampled and then the panel with 2

washes, the panel with 1 wash, and the untreated panel. All samples were sent to DataChem Laboratories for analysis.

The bunker gear was transported in plastic bags to the area to sample. Similar to the cloth, the bunker gear was sampled prior to any treatment. Samples were collected from both the inside and the outside materials by cutting a 100 cm<sup>2</sup> square from the material of the jackets. The jackets were then washed one time or three times and then sampled again on both the inside and the outside. A total of 8 samples were taken from each of the jackets prior to treatment and another eight samples were taken after the treatment.



Figure 3. Samples taken from the outside of the fire department bunker gear.



Figure 4. Samples taken from the inside of the fire department bunker gear.



After the pre-sampling, the bunker gear was washed in a household washer using warm temperature water and Cold Water Tide as the detergent. No bleach was utilized and the bunker gear was washed using a medium agitation setting. After one wash, one set of bunker gear was removed and the other jacket washed two more times.

After the material was washed, it was hung to dry overnight and then the post samples were obtained. All samples were sent to DataChem Laboratories for analysis.

## Results:

A total of 56 clothing samples were submitted to the laboratory for testing. For each group of 7 samples, a mean and median methamphetamine level was calculated for both the pre-treatment and the post treatment results. These were compared to determine a percent reduction for each of the materials. The results for the denim cloth were as follows:

<i><b>Treatment</b></i>	<i><b>Pre-Mean (ug/100 cm<sup>2</sup>)</b></i>	<i><b>Pre-Median (ug/100 cm<sup>2</sup>)</b></i>	<i><b>Post-Mean (ug/100 cm<sup>2</sup>)</b></i>	<i><b>Post-Median (ug/100 cm<sup>2</sup>)</b></i>	<i><b>Mean % Reduction</b></i>
<i><b>No Treatment</b></i>	112	110	123	120	- 9%
<i><b>One Wash</b></i>	150	150	0.9	0.8	99.4%
<i><b>Two Washes</b></i>	115	120	0.3	0.3	99.7%
<i><b>Three Washes</b></i>	101	100	0.2	0.2	99.8%

These data show that the initial contamination levels were relatively even for each of the panels and generally ranged from a low of 100 ug/100 cm<sup>2</sup> to a high of 150 ug/100 cm<sup>2</sup>. These levels are somewhat higher than levels that we normally find in actual laboratories but the higher contamination levels enabled us to determine the removal effectiveness in highly contaminated situations. The initial removal rate for a single wash, under the stated conditions, was 99.4%. The single wash removed a significant amount of the methamphetamine present and dropped the contamination level to approximately 0.9 ug/100 cm<sup>2</sup>, a level that approaches many of the decontamination levels promulgated by the states.

The second wash reduced the levels to a slightly lower level, with the % reduction being approximately 99.7%. The resulting methamphetamine level was approximately 0.3 ug/100 cm<sup>2</sup>, which is below the contamination level that is of concern for many states. The third wash continued to reduce the methamphetamine levels so that the percent reduction was approximately 99.8%. The contamination level had dropped to a level of

approximately 0.2 ug/100 cm<sup>2</sup>. This level is only slightly above the most stringent level for the majority of states.

The results for the cotton cloth were as follows:

<i>Treatment</i>	<i>Pre-Mean (ug/100 cm<sup>2</sup>)</i>	<i>Pre-Median (ug/100 cm<sup>2</sup>)</i>	<i>Post-Mean (ug/100 cm<sup>2</sup>)</i>	<i>Post-Median (ug/100 cm<sup>2</sup>)</i>	<i>Mean % Reduction</i>
<i>No Treatment</i>	255	290	156	140	39%
<i>One Wash</i>	271	240	0.5	0.5	99.8%
<i>Two Washes</i>	218	210	0.2	0.2	99.9%
<i>Three Washes</i>	125	120	0.2	0.2	99.8%

There was a greater reduction for the cotton cloth while it was being air dried overnight. There was a 39% reduction in the methamphetamine contamination level in the untreated cotton cloth while the denim cloth held the methamphetamine in the cloth. This difference may be caused by the looser weave in the cotton as compared to the denim cloth. The percent reduction due to the initial wash was also higher for the cotton cloth with a 99.8% reduction compared to a 99.4% reduction in the denim. In both cases however, the level of reduction due to the initial wash was significant. In the case of the cotton cloth, subsequent washes did not appear to reduce the methamphetamine very much. A 0.2 ug/100 cm<sup>2</sup> contamination level was about as low as could be achieved in either cloth, after all three washes. This levels is, however, very low.

The results for the fire department bunker gear were as follows:

<i>Treatment</i>	<i>Pre-Mean (ug/100 cm<sup>2</sup>)</i>	<i>Pre-Median (ug/100 cm<sup>2</sup>)</i>	<i>Post-Mean (ug/100 cm<sup>2</sup>)</i>	<i>Post-Median (ug/100 cm<sup>2</sup>)</i>	<i>Mean % Reduction</i>
<i>One Wash Outside</i>	102	96.5	4	4	96.1%
<i>One Wash Inside</i>	64	12	3.4	3.5	94.6%
<i>Three Washes Outside</i>	109	105	1.3	1.4	98.8%
<i>Three Washes Inside</i>	19.5	15.5	1.6	1.7	91.8%



The inside of the bunker gear was not as contaminated as the outside. In both cases, however, the level of methamphetamine was significantly reduced by a single wash in warm water with normal soap in a washing machine. This material is very dense with a number of layers including Nomex and reflective material. The 90% reduction suggests that most of the methamphetamine is removed in the initial wash. As in the cloth, the rest of the methamphetamine is difficult to remove and even three washes does not remove all of the methamphetamine present. Washing did reduce the levels of methamphetamine to levels that may not be of consequence to individuals wearing the gear. This gear is normally worn as outer protective gear and may not have skin contact at all times.

### **Conclusions:**

It appears that the ability to remove methamphetamine contamination from clothing is relatively easy using a normal washing machine and detergent. A 99% reduction in the amount of contamination is realized in a single wash and after 3 washes, a reduction of 99.8% is very possible. Washing even extremely dense and layered material such as fire department bunker gear result in over a 90% reduction in most cases. In all cases, the small amount of methamphetamine left appears to be difficult to remove further and may not provide an unacceptable risk to individuals wearing or coming into contact with the clothing. Subsequent washes may, over time, result in all of the methamphetamine being removed from the clothing. In addition, no bleach was utilized in this experiment and a reaction between the bleach and the methamphetamine could result in even lower levels after just one wash.

The significance of this project is that in most instances, simply washing clothing in a washing machine will result in enough methamphetamine reduction to protect those individuals that may come into contact with the clothing. It appears to be possible to keep a child's clothing rather than throwing the clothing out. Using this same principal, a child's favorite blanket or other item may be able to be recovered from a laboratory and given back to the child as long as the item can be put into a washing machine. We did not test all types of clothing and some material may be harder to clean. It is possible that jackets and other thick materials may be more difficult to decontaminate. It is also unlikely that materials such as leather jackets and pants that can't be put into a washing machine will be easily decontaminated.

This project also has significance for individuals who accidentally come into contact with a clandestine methamphetamine laboratory during their work. Social services employees and child protective services employees may be comforted by the suggestion that after inadvertently entering a laboratory, simply washing the clothing will remove most all of the contamination. These findings indicate that upon finding themselves in a potential clandestine laboratory, these personnel could simply go back to their residence and wash their clothing using normal methods and eliminate the potential for continued contamination of other surfaces. Based upon our testing, if any methamphetamine is left behind, it will not easily be removed or transferred from the clothing to the individual coming into contact or wearing the clothing.

It should also be emphasized that the amount of methamphetamine contamination in the clothing tested is higher than we would expect at anything but an active methamphetamine laboratory. Our experiments suggest a mean contamination level for individuals entering a clandestine laboratory will be less than 20 ug/100 cm<sup>2</sup>, a level that is only 1/10<sup>th</sup> of the contamination level that we used in the clothing tested in this project. A single wash in those cases may adequately reduce any methamphetamine level to levels that would not be of concern.

#### References:

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